
XIII. *Account of the Germination and Raiſing of Ferns from the Seed. By Mr. John Lindſay, Surgeon in Jamaica. Communicated by Sir Joſeph Banks, Bart. P. R. S. and H. M. L. S.*

Read Jan. 3, 1792.

IT was not generally known many years ago that ferns bore any ſeed, hence the notion of its power of rendering whomſoever poſſeſſed it inviſible[*]; and it does not appear that the writers on Natural Hiſtory are yet very well acquainted with the real ſeeds of ferns, or from what particular part the young plants are produced. In the *Encyclopedia Britannica*, 3d edition, where good information might be expected, we have this account of the fructification of ferns: "The flowers, whatever be their nature, are, in the greater number of genera, faſtened, and as it were glued to the back of the leaves; in others, they are ſupported upon a ſtem which riſes above the leaves, but in ſome are ſupported on a flower-ſtalk as already mentioned: the ſtamina are placed apart from the ſeed-bud in a genus termed by Mr. Adanſon *Palma filix:* in the other ferns, where we have been able to diſcover the ſtamina, they are found within the ſame cover with the ſeed-bud[†]." While ſtudying medicine at Edinburgh, I had good opportunities of getting acquainted with the fructification of ferns, under the direction of my worthy

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[*] "We ſteal as in a caſtle, cock ſure; we have the receipt of fern-ſeed, we walk inviſible." SHAKESPEARE.

[†] Vide Filix in the article Botany.

friend

friend and patron Dr. Hope, late profeſſor of botany there. But I did not then learn that any of thoſe parts which I had ſeen were the real ſeeds, or capable of producing new ferns. I underſtood that this point was ſtill uncertain.

When I came to Jamaica, I obſerved great numbers of ſmall young ferns riſing after the rains in marle and gravel pits, and on the ſhaded banks of rivers which had been broken down by the floods; and indeed in every place where the earth had been dug into, and left ſhaded and untouched for a few months, numbers of young ferns of different kinds generally began to appear. This I conſidered as a fair opportunity of aſcertaining from what part the young fern aroſe. I had ſome ſpare time, which with propriety I could dedicate to that purpoſe, being aſſiſtant to my good friend Dr. Clarke, botaniſt for the iſland, and I had the opportunity of a good microſcope. The minuteneſs of the ſeeds rendered every attempt to diſcover them, by ſearching at the roots of even the ſmalleſt viſible plants, entirely fruitleſs. I then thought of ſowing the powder or duſt, which falls from the fern leaves when drying, in a flower-pot, of keeping them in my room, and of obſerving their progreſs. To enable me to do this with eaſe and certainty, I mixed ſome of the powder with ſome of the mould it was to be ſown in, and by the help of the microſcope was ſoon able to diſtinguiſh readily the different parts of the powder, or fructification, from the particles of the mould in which it was ſown. Having collected the duſt of ſome of thoſe ferns which, from the number of their young ones riſing every where, promiſed to grow readily, and ſown it in a pot filled with the ſame kind of mould in which the young ones grew, I placed the pot in a window of my room, watered it daily, and every day or two examined a ſmall portion of the mould by the microſcope. I could always readily diſtinguiſh the duſt or ſeeds from the mould, but obſerved no alteration till about

about the 12th day after ſowing, when many of the ſmall ſeeds, repreſented at 6 in the annexed plate, had put on a greeniſh colour, and ſome were puſhing out their little germ, like a ſmall protuberance, the rudiment of the new fern, as at 8. This little protuberance gradually enlarged, and ſucceſſively put on the appearances at 9, 10, and 11. They had acquired ſmall roots, and the remains of the little ſeeds were ſtill diſcernible where the roots of the infant plant commenced. Although the young ferns were now very conſpicuous by the microſcope, the naked eye could ſee nothing but a green appearance on the ſurface of the mould, as if it were covered with ſome very ſmall moſs: this was the numberleſs young plants from the quantity of the ſeed ſown. In ſome weeks this moſs began to appear to the naked eye like ſmall ſcales, as at 13, which gradually enlarged, as at 14: they were generally of a roundiſh figure, ſomewhat bilobate, but ſometimes more irregular; they were of a membranous ſubſtance, like ſome of the ſmall *lichens* or liverworts, for which they might readily be miſtaken, and of a dark green colour. At laſt there ariſes from this membrane a ſmall leaf, different from it in colour and appearance, as at 15, and ſhortly after another ſtill more different, as at 16. Now each ſucceeding leaf grows larger than the laſt, till they attain the full ſize, and are complete in all the parts and diſcriminating characters of their reſpective ſpecies. Some of the above obſervations appearing to me new, I communicated them to Dr. Hope. He judiciouſly offered a few queries, founded on the deceptions to which obſervations made by high magnifiers are often liable: theſe I endeavoured to anſwer; he was ſatisfied, and promiſed to lay the obſervations before the Royal Society of Edinburgh.—But that city ſoon after loſt an amiable member of ſociety, and I a friend, whoſe memory will be dear to me while I live. Engaging in the practice of medicine ſoon after, I thought no more of the ſubject, till I had the honour of a

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very polite letter from Sir Joſeph Banks, Bart. P. R. S. dated March 29, 1789, where, after mentioning ſome other plants, he obſerved that ferns would be particularly acceptable. In anſwer I obſerved, that the riſk of carrying many of the ferns alive ſuch a diſtance was great, and propoſed to ſend ſome of their ſeeds, which, being properly ſown, I had reaſon to believe would grow. He very ſoon informed me that, if I could furniſh the means of making the ferns of this iſland grow in England from the ſeeds, I ſhould have the credit of making a very valuable diſcovery, and requeſted I would ſend him ſome ſeeds, with my notes on this ſubject, by the firſt opportunity. Being now more convinced that the ſeeds, and progreſs of the germination of ferns, were ſtill but little known, I collected the ſeeds of 16 or 18 different ſorts, and ſowed them in a flower-pot in my room, of about 10 inches diameter, each in a ſeparate ſpace, and marked. I kept the pot in my room, and watered them duly. They all appeared between the 10th and 20th day, in the form of a ſmall green moſs on the ſurface, and at length were putting on the membranaceous form, when they were all deſtroyed by being expoſed to the ſun in a dry hot day. I repeated the ſowing of the ſeeds in the flower-pot; and alſo ſowed others in the mouth of a marle pit, ſhaded from the ſun's rays, where no ferns of the ſame kind had grown before. They are all now growing; and thoſe in the flower-pot have made ſome progreſs in the membranous form; and in the marle pit they are beginning to put out the leaves peculiar to their ſpecies.—Having now pointed out the ſeeds, or that part of the fructification, from which the young plants of this beautiful and curious tribe of vegetables, the ferns, ariſe, and ſhown the beginning of their germination and progreſs of their growth; it remains to ſay a few words concerning the gathering and ſowing of their ſeeds.

The ſeeds of ferns may be procured with readineſs and eaſe by taking thoſe frondes or leaves on which the fructification is copious, fair and conſpicuous; which are of full growth, have a healthy appearance, and are more expoſed to the free air than confined in ſhade. Theſe leaves, laid on clean paper in a dry place, ſoon ſhed their ſeed in the form of duſt or fine powder, of colour varying from black or brown to yellow: the groſſer part of this powder is the empty capſules, and that very fine part which adheres cloſely to the paper is the ſeed. The ſeeds thus procured may be ſown immediately, or kept in paper in a dry place. How long they will retain the principle of vegetation I cannot ſay. I have kept ſome above three months, which grew well enough when ſown; but they ſeemed to be rather longer in vegetating than thoſe freſhly gathered. There are doubtleſs many ſpecies of ferns, which, like other vegetables, require a ſoil and ſituation peculiar to themſelves, yet we often find the ſame ſpecies growing in different ſoils: hence the propriety of attending to the ſoil and ſituation of each ſpecies is pointed out, and at the ſame time there is room left for trying a general medium.—I took equal parts of brick mould and good pit marle, at ſome depth below the ſurface, to avoid the ſeeds of other plants, mixed them well together, and with this filled the flower-pot, moiſtened it properly, and made the ſurface very ſmooth: I then divided it into ſmall ſpaces, according to the number of the different kinds intended to be ſown in it; and laſtly ſtrewed the ſeeds lightly on the ſurface, which may be moiſtened with a little water juſt before they are ſown: they require no covering. They ſhould now be placed in a heat correſponding to that of their native climate, in a place rather moiſt than too dry, freely open to the light and freſh air, but ſo ſhaded that the direct rays of the ſun ſhall not reach them. All ferns ſeem to grow beſt in moiſt and ſhaded places; and although many of them will bear the ſun's rays very well when grown up, few of them, I believe, will do ſo when very young. They ſhould be daily moiſtened with water in the moſt gentle manner poſſible, and the pot may be kept in a baſon with a little water in it. Great care is requiſite to keep them from all ſorts of vermin: covering the mouth of the pot with a net-work of fine braſs wire anſwered this purpoſe with me.—In about 10 or 15 days, or perhaps later, the ſurface will begin to look green, as if ſome fine moſs were beginning to grow on it: this will gradually increaſe, and the progreſs will be nearly as I have deſcribed.—What relates to the tranſplanting of them, after they have acquired a little ſtrength, will eaſily be judged of by every one accuſtomed to the raiſing and tranſplanting of other plants; and the rearing of them afterwards will be beſt underſtood by attending to the ſoil, ſituation, and climate from which they have come. What ſpace of time may be required between the ſowing of their ſeeds and their acquiring the leaves proper to each ſpecies, I cannot readily point out; in different ſorts it may be different: the ſhorteſt I have obſerved has been almoſt three months, ſometimes more; but this may be varied no doubt by various circumſtances. Having thus given an account of the germination and progreſſive growth of young ferns, it only remains to give ſome deſcription of the fructification, which I ſhall do in a few words, aſſiſted by the annexed drawing.

EXPLANATION of TAB. 18.

Figure 1. repreſents a leaf of the Polypodium lycopodioides, and the dots the little cluſters of fructifications. Each cluſter is generally[*] covered with a thin membrane or ſcale, commonly called the calyx.

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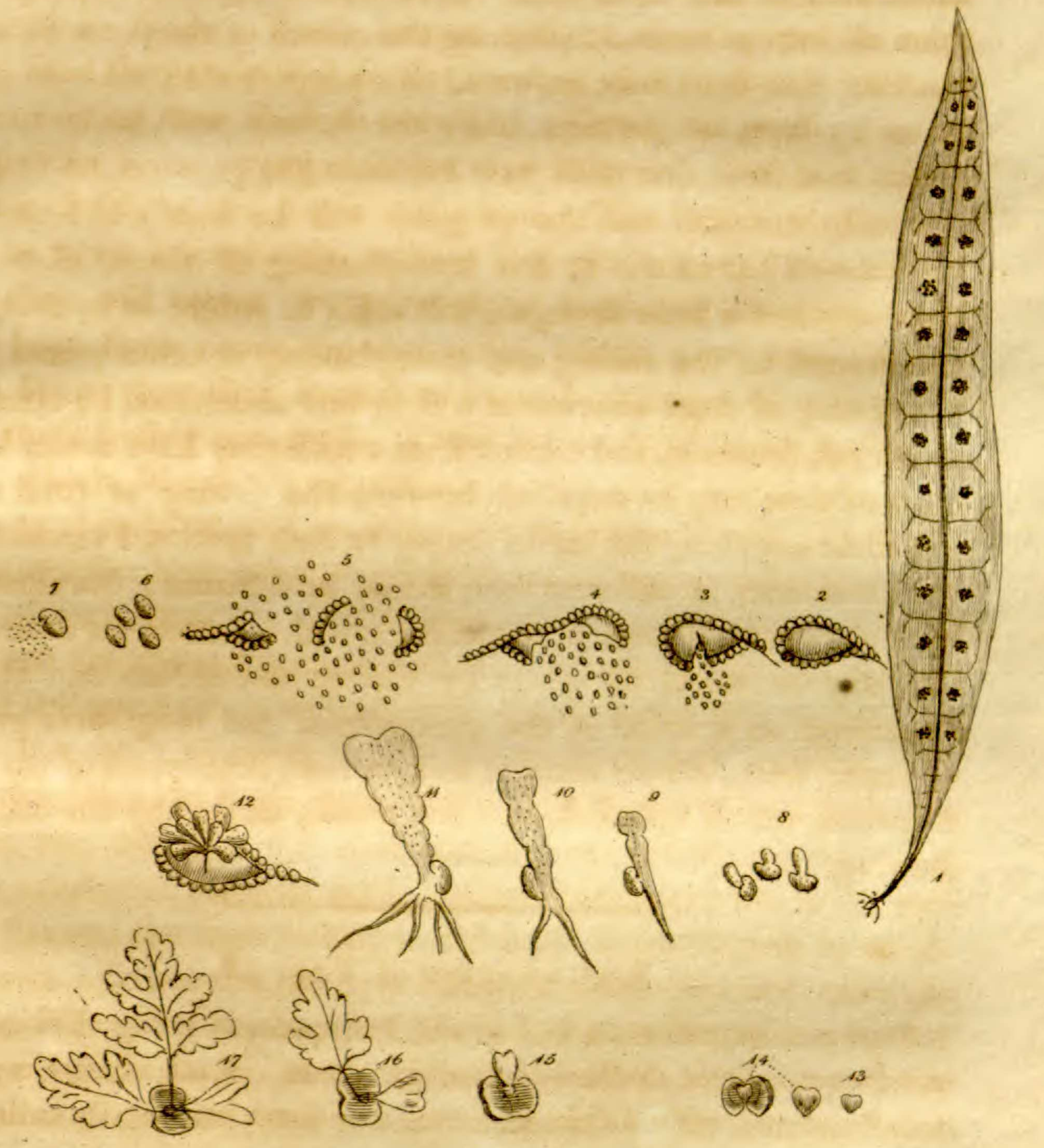
[*] Many, if not moſt ſpecies of the genus Acroſtichum, and this, with ſeveral other ſpecies of Polypodium, want this membrane or calyx. This difference therefore, Flores caliculati, et non caliculati, vel nudi, might be uſeful in diſtinguiſhing the numerou ſpecies of this extenſive genus.

Linn. Trans. II. tab. 18. p. 98.



calyx, and conſiſts of a number of ſmall globules or capſules: each capſule is girt with an elaſtic and apparently articulated ring, which when dry, breaks ſuddenly, rends the capſule, and ſcatters the ſeeds in the form of a fine duſt*.—2. One of the capſules and its elaſtic ring magnified.—3, 4, and 5. Different views of the capſule burſting and diſcharging the ſeeds.—6. The ſeeds highly magnified appearing full of dots, as if they contained another ſeries of bodies within them: this has been alleged as a proof of their not being the real ſeeds.—7. The ſeed burſt by being bruiſed when moiſt, its contents giving the appearance of ſmall grains mixed in a tranſparent mucilage.—8, 9, 10, and 11. Different degrees of progreſs in the germination, to be ſeen only by being highly magnified.—12. A whole capſule prevented from burſting by moiſture, with the ſeeds vegetating, and making their way through it.—13. The firſt appearance of the young fern in the form of a ſmall thin ſcale; theſe may be ſeen by the naked eye.—14. The ſcales gradually becoming larger, and appearing like ſmall *lichens* or liverworts.—15. The firſt appearance of the firſt true leaf of the fern.—16, 17. Ferns with the ſecond and third leaves beginning to take the form of their proper ſpecies.

HAVING now given ſome uſeful additions to the hiſtory of this beautiful tribe of plants, the Ferns, I ſhall conclude with expreſſing my hopes that ſome additional light will ſoon be thrown on the fructification and germination of thoſe curious vegetables the *Muſci* or Moſſes, and others of the claſs *Cryptogamia*, by men of abilities, and ſhall give an inſtance in proof that the hope is

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* With the anthera, or what is analogous to it, I am yet unacquainted; it has been ſuppoſed to be the elaſtic ring, but I do not know if with good reaſon.